

Chapter 7 — Writing Linear Equations

Teacher Guide

Teacher Chapter-at-a-Glance

Materials

Graph paper (optional). No manipulatives required.

Pacing

Spend the most time on Method 4 (two points) and the Sign Warning. These generate the most Tripwire misses.

Talk Prompt

"What two pieces of information do you actually have, and which row of the Decision Chart matches them?"

If Ready-to-Learn Reveals a Gap

If students cannot find slope from two points or substitute a point into $y = mx + b$, reteach the relevant part of Chapter 6 before continuing.

Mastery Decision Guide

What a missed Tripwire item actually means, and what to do about it before moving on.

Missed Tripwire #1 → Sign Error in Point-Slope Form (Mistake 3). *Given a point with a negative y-coordinate, writes $y -$ [positive version] instead of $y - (-$ [the actual coordinate]).* Review before the next chapter.

Ready-to-Learn Check

Quick check before starting. A wrong answer below points to a specific gap worth closing first, not just a miss to shrug off.

1. In $y = 3x - 4$, identify m and b .

Correct answer: $m = 3$, $b = -4$

Likely wrong answer: $m = 3$, $b = 4$

Misconception: Drops the negative sign on the constant term, treating b as the digit that appears rather than the signed value being added.

Next move: Rewrite the equation as $y = 3x + (-4)$ before naming b , so the sign is visible before it gets dropped.

2. Find the slope through $(1, 2)$ and $(3, 6)$.

Correct answer: $m = 2$

Likely wrong answer: $m = 1/2$

Misconception: Divides the horizontal change by the vertical change instead of vertical by horizontal, flipping the ratio.

Next move: Review Chapter 6's slope formula. Label which difference is the y -change and which is the x -change before dividing.

3. A line has slope 4 and passes through $(1, 6)$. Use $y = mx + b$ to find b .

Correct answer: $b = 2$, so $y = 4x + 2$

Likely wrong answer: $b = 6$

Misconception: Assumes the y -value of any given point is automatically the y -intercept.

Next move: This exact confusion opens the chapter below. Flag it now and return to it once slope-intercept form has been introduced.

Common Mistakes

TEACHING NOTE

Mistake 3 (sign error) is the dominant one and drives the Tripwire Check. Spend the most reteaching time here.

Students often run into the same kinds of trouble with this topic. Recognizing these patterns helps avoid them.

Mistake 1: Treating Any y-Value as the y-Intercept

What students do: A line has slope 2 and passes through (3, 7). A student writes $y = 2x + 7$.

Why this happens: The student sees the y-coordinate 7 and assumes it is b.

What to do instead: The y-intercept only occurs when $x = 0$. Since the point is (3, 7), it is not the y-intercept. The correct equation is $y = 2x + 1$.

Diagnostic trigger: Writes b equal to the y-value of a given point that is not on the y-axis, e.g. turns (3, 7) directly into $b = 7$.

Mistake 2: Forgetting to Find Slope First

What students do: Given two points, a student tries to write the equation without first finding m.

Why this happens: The student wants to jump straight to $y = mx + b$ without having a slope value to put in it.

What to do instead: Two points give the slope first: $m = (y_2 - y_1)/(x_2 - x_1)$. Only then can one point be used to find b.

Diagnostic trigger: Given two coordinate pairs, writes an equation with no slope calculation shown anywhere in the work.

Mistake 3: Sign Error in Point-Slope Form

What students do: For point (2, -3), a student writes $y - 3 = m(x - 2)$.

Why this happens: Students drop the negative sign already sitting on the coordinate.

What to do instead: Correct substitution is $y - (-3) = m(x - 2)$, which simplifies to $y + 3 = m(x - 2)$.

Diagnostic trigger: Given a point with a negative y-coordinate, writes $y - [\text{positive version}]$ instead of $y - (-[\text{the actual coordinate}])$.

Mistake 4: Forcing a Vertical Line into $y = mx + b$

What students do: A student tries to write the vertical line through $x = 4$ as $y = 4x + b$.

Why this happens: Students think every line must be written in slope-intercept form.

What to do instead: A vertical line has equation $x = a$. Its slope is undefined, so it cannot be written as $y = mx + b$ at all.

Diagnostic trigger: Given a vertical line description, attempts to name a numeric slope for it instead of writing $x = a$.

Mistake 5: Using the Reciprocal Instead of the Negative Reciprocal

What students do: A line has slope 4. A student says the perpendicular slope is $1/4$.

Why this happens: The student remembers "reciprocal" but forgets the negative sign.

What to do instead: The perpendicular slope is $-1/4$, because $4 \times -1/4 = -1$.

Diagnostic trigger: Gives a perpendicular slope with the same sign as the original line's slope.

Mistake 6: Not Checking the Final Equation

What students do: A student writes an equation and moves on without substituting the given point back in.

Why this happens: The equation "looks right," so the check feels unnecessary.

What to do instead: Substitute the point. If it does not satisfy the equation, the equation is wrong, no matter how it looks.

Diagnostic trigger: The submitted equation does not actually satisfy the point it was supposedly built from.

Practice

Teacher solutions follow this practice set.

1. Slope 6, y-intercept -2.
2. Slope -2, y-intercept 5.
3. Slope 2, crosses the y-axis at 3.
4. Slope 3, passes through (0, -4).
5. Horizontal line through (2, 5).
6. Slope 3, through (2, 8).
7. Slope -1, through (-2, 5).
8. Slope $1/2$, through (4, -1).
9. Slope -3, through (0, 7).
10. Slope 0, through (-5, 2).

11. Write the equation of the line through (2, 3) and (4, 9).
12. Write the equation of the line through (-1, 5) and (2, -1).
13. Write the equation of the line through (0, -4) and (2, 0).
14. Write the equation of the line through (3, 2) and (3, 8).
15. Write the equation of the line through (-2, 5) and (4, 5).
16. Write the equation of a line parallel to $y = 3x - 5$ that passes through (0, 2).
17. Write the equation of a line perpendicular to $y = 2x + 1$ that passes through (0, -4).
18. Are these lines parallel? $y = 4x - 3$ and $y = 4x + 8$. Explain.
19. Write the equation of a line perpendicular to $y = -\frac{1}{3}x + 2$ that passes through (6, -1).
20. Write the equation of a line perpendicular to $y = -3x + 1$ that passes through (0, 6).
21. A phone plan costs \$30 per month plus \$5 per GB of data. Write an equation for cost C in terms of GB used, g . Find the cost for 12 GB, then find g if the bill is \$75.
22. A table shows a linear relationship: when x is 0, 1, 2, 3, y is 3, 5, 7, 9. Write the equation.
23. A worker starts with \$200 saved and saves \$80 each week. Write an equation for savings S after w weeks. Find when the worker will have \$1000.
24. A student says a line with slope 2 passing through (2, -1) must pass through the origin because the slope is 2. Explain the error and write the correct equation.
25. Explain why a vertical line cannot be written in slope-intercept form.

Practice Solutions

Use these concise solutions to check the method as well as the final answer.

1. Slope 6, y-intercept -2.

Solution: Use $y = mx + b$ with $m = 6$ and $b = -2$: $y = 6x - 2$.

2. Slope -2, y-intercept 5.

Solution: Use $y = mx + b$ with $m = -2$ and $b = 5$: $y = -2x + 5$.

3. Slope 2, crosses the y-axis at 3.

Solution: Crossing the y-axis at 3 means $b = 3$: $y = 2x + 3$.

4. Slope 3, passes through (0, -4).

Solution: The point (0, -4) gives $b = -4$: $y = 3x - 4$.

5. Horizontal line through (2, 5).

Solution: A horizontal line through (2, 5) has constant y-value 5: $y = 5$.

6. Slope 3, through (2, 8).

Solution: Point-slope form gives $y - 8 = 3(x - 2)$, so $y = 3x + 2$.

7. Slope -1, through (-2, 5).

Solution: Point-slope form gives $y - 5 = -1(x + 2)$, so $y = -x + 3$.

8. Slope $1/2$, through (4, -1).

Solution: Point-slope form gives $y + 1 = 1/2(x - 4)$, so $y = 1/2x - 3$.

9. Slope -3, through (0, 7).

Solution: Since the point is (0, 7), $b = 7$: $y = -3x + 7$.

10. Slope 0, through (-5, 2).

Solution: A line with slope 0 is horizontal. Through (-5, 2), its equation is $y = 2$.

11. Write the equation of the line through (2, 3) and (4, 9).

Solution: $m = (9 - 3)/(4 - 2) = 3$. Using (2, 3): $y - 3 = 3(x - 2)$, so $y = 3x - 3$.

12. Write the equation of the line through (-1, 5) and (2, -1).

Solution: $m = (-1 - 5)/(2 - (-1)) = -2$. Using (-1, 5): $y - 5 = -2(x + 1)$, so $y = -2x + 3$.

13. Write the equation of the line through (0, -4) and (2, 0).

Solution: $m = (0 - (-4))/(2 - 0) = 2$. Since $b = -4$, $y = 2x - 4$.

14. Write the equation of the line through (3, 2) and (3, 8).

Solution: Both points have $x = 3$, so the line is vertical: $x = 3$.

15. Write the equation of the line through (-2, 5) and (4, 5).

Solution: Both points have $y = 5$, so the line is horizontal: $y = 5$.

16. Write the equation of a line parallel to $y = 3x - 5$ that passes through (0, 2).

Solution: A parallel line keeps slope 3. Through (0, 2), $b = 2$, so $y = 3x + 2$.

17. Write the equation of a line perpendicular to $y = 2x + 1$ that passes through (0, -4).

Solution: The perpendicular slope to 2 is $-1/2$. Through (0, -4), $y = -1/2x - 4$.

18. Are these lines parallel? $y = 4x - 3$ and $y = 4x + 8$. Explain.

Solution: Yes. Both lines have slope 4, so they are parallel.

19. Write the equation of a line perpendicular to $y = -1/3x + 2$ that passes through (6, -1).

Solution: The perpendicular slope to $-1/3$ is 3. Using (6, -1): $y + 1 = 3(x - 6)$, so $y = 3x - 19$.

20. Write the equation of a line perpendicular to $y = -3x + 1$ that passes through $(0, 6)$.

Solution: The perpendicular slope to -3 is $1/3$. Through $(0, 6)$, $y = 1/3x + 6$.

21. A phone plan costs \$30 per month plus \$5 per GB of data. Write an equation for cost C in terms of GB used, g . Find the cost for 12 GB, then find g if the bill is \$75.

Solution: $C = 5g + 30$. For 12 GB, $C = 90$. If $C = 75$, then $75 = 5g + 30$, so $g = 9$.

22. A table shows a linear relationship: when x is 0, 1, 2, 3, y is 3, 5, 7, 9. Write the equation.

Solution: The y -values rise by 2 for each increase of 1 in x , and $y = 3$ when $x = 0$: $y = 2x + 3$.

23. A worker starts with \$200 saved and saves \$80 each week. Write an equation for savings S after w weeks. Find when the worker will have \$1000.

Solution: $S = 80w + 200$. Solve $1000 = 80w + 200$ to get $w = 10$ weeks.

24. A student says a line with slope 2 passing through $(2, -1)$ must pass through the origin because the slope is 2. Explain the error and write the correct equation.

Solution: Slope does not determine the intercept. Using $(2, -1)$: $y + 1 = 2(x - 2)$, so $y = 2x - 5$.

25. Explain why a vertical line cannot be written in slope-intercept form.

Solution: A vertical line has undefined slope, so it cannot be written as $y = mx + b$. Its equation is $x = a$ constant.

Tripwire Check

These questions test whether the thinking is solid — not just whether the procedure was memorized. Each wrong answer below points to a specific misconception, not just "try again."

1. A line has slope 4 and passes through $(1, -5)$. A student writes $y - 5 = 4(x - 1)$ and gets $y = 4x + 1$. Is the student correct? If not, explain the error and write the correct equation.

Correct answer: No. The point is $(1, -5)$, so $y - (-5) = 4(x - 1)$, which gives $y + 5 = 4(x - 1)$, then $y + 5 = 4x - 4$, so $y = 4x - 9$.

Likely wrong answer: $y = 4x + 1$

Misconception: The student changed -5 into $+5$ and wrote $y - 5$ instead of $y - (-5)$.

Next move: Reteach the Sign Warning with the point's coordinates written out explicitly before substituting, rather than moved straight into the formula.

Answer Key — Worksheets (Full Diagnostic)

Worksheet A: Guided Practice

1. Write the equation of a line with slope 5 and y-intercept -3.

1. $y = 5x - 3$ Likely wrong answer: $y = -3x + 5$ (swaps slope and intercept). Misconception: The slope and y-intercept are assigned to the wrong positions in $y = mx + b$.

2. Write the equation of a line with slope -2 and y-intercept 5.

2. $y = -2x + 5$ Likely wrong answer: $y = 5x - 2$ (swaps slope and intercept). Misconception: The slope and y-intercept are assigned to the wrong positions in $y = mx + b$.

3. Write the equation of a line with slope 3 through (2, 8).

3. $y = 3x + 2$ (from $8 = 3(2) + b$) Likely wrong answer: $y = 3x + 8$ (uses the y-coordinate as b directly instead of solving for it). Misconception: The given point's y-value is used as the y-intercept without substituting to solve for b.

4. Write the equation of a line through (0, 4) with slope 2.

4. $y = 2x + 4$ Likely wrong answer: $y = 4x + 2$ (swaps slope and the given y-intercept). Misconception: The slope and y-intercept are assigned to the wrong positions in $y = mx + b$.

5. Write the equation of the line through (1, 2) and (3, 8).

5. $y = 3x - 1$ (slope $8 - 2 / 3 - 1 = 3$) Likely wrong answer: $y = 3x + 2$ (finds the slope correctly but miscalculates b). Misconception: The slope is found correctly, but substituting a point to solve for b is skipped or done incorrectly.

6. Are these lines parallel? $y = 2x + 1$ and $y = 2x - 4$.

6. Yes. Both lines have slope 2. Likely wrong answer: No, because the y-intercepts differ. Misconception: The y-intercept is compared instead of the slope when checking for parallel lines.

7. Find the slope perpendicular to $m = 3$.

7. $-1/3$ Likely wrong answer: 3 (uses the reciprocal without negating it). Misconception: Only the reciprocal is taken; the sign is not flipped for a perpendicular slope.

8. Write the equation of a line with slope -1 and y-intercept 3.

8. $y = -x + 3$ Likely wrong answer: $y = x + 3$ (misses that -1 means -1x). Misconception: A negative slope of 1 is read as if it were positive.

9. Write the equation of a horizontal line through (0, -2).

9. $y = -2$ Likely wrong answer: $x = -2$ (writes a vertical line instead of a horizontal one). Misconception: Horizontal and vertical line equations are mixed up.

10. Write the equation of a vertical line through (4, 1).

10. $x = 4$ Likely wrong answer: $y = 4$ (writes a horizontal line instead of a vertical one). Misconception: Horizontal and vertical line equations are mixed up.

11. A table shows: when x is 0, 1, 2, y is 5, 7, 9. Write the equation.

11. $y = 2x + 5$ Likely wrong answer: $y = 2x + 7$ (uses the second y -value as the intercept instead of the value at $x = 0$). Misconception: The y -intercept is read from the wrong row of the table instead of where $x = 0$.

12. Write the equation of a line with slope $1/3$ through (6, 4).

12. $y = 1/3x + 2$ (from $4 = 1/3(6) + b$) Likely wrong answer: $y = 1/3x + 4$ (uses the y -coordinate as b directly instead of solving for it). Misconception: The given point's y -value is used as the y -intercept without substituting to solve for b .

13. Write the equation of a line with slope -4 through (-1, 3).

13. $y = -4x - 1$ (from $3 = -4(-1) + b$) Likely wrong answer: $y = -4x + 7$ (mishandles the double negative when substituting $x = -1$). Misconception: Substituting a negative x -value into $-4(x)$ loses track of the resulting sign.

14. A service charges \$10 to start and \$6 per hour. Write an equation for cost C after h hours.

14. $C = 6h + 10$ Likely wrong answer: $C = 10h + 6$ (swaps the flat fee and the per-hour rate). Misconception: The flat starting fee and the per-unit rate are assigned to the wrong roles.

15. Is (3, 10) on the line $y = 2x + 4$?

15. Yes. $2(3) + 4 = 10$. Likely wrong answer: No (substitutes y instead of x , or miscalculates). Misconception: The wrong coordinate is substituted into the equation during the check.

Worksheet B: Independent Practice

1. Slope -3, y-intercept 0.

1. $y = -3x$ Likely wrong answer: $y = -3x + 3$ (invents a y-intercept instead of using 0).

Misconception: A y-intercept of 0 is not trusted and a nonzero value is used instead.

2. Slope 1, y-intercept -4.

2. $y = x - 4$ Likely wrong answer: $y = -4x + 1$ (swaps slope and intercept). Misconception: The slope and y-intercept are assigned to the wrong positions in $y = mx + b$.

3. Slope -1, y-intercept 6.

3. $y = -x + 6$ Likely wrong answer: $y = x - 6$ (misses that -1 means $-1x$, and swaps the sign of the intercept). Misconception: A negative slope of 1 is read as positive, and the intercept's sign is also lost.

4. Write the equation of a vertical line through (7, -5).

4. $x = 7$ (vertical line) Likely wrong answer: $y = -5$ (writes a horizontal line instead of a vertical one). Misconception: Horizontal and vertical line equations are mixed up.

5. Write the equation of a horizontal line through (-4, 2).

5. $y = 2$ (horizontal line) Likely wrong answer: $x = -4$ (writes a vertical line instead of a horizontal one). Misconception: Horizontal and vertical line equations are mixed up.

6. Slope 3, through (0, 7).

6. $y = 3x + 7$ Likely wrong answer: $y = 7x + 3$ (swaps slope and the given y-intercept).

Misconception: The slope and y-intercept are assigned to the wrong positions in $y = mx + b$.

7. Slope -2, through (1, 3).

7. $y = -2x + 5$ Likely wrong answer: $y = -2x + 3$ (uses the y-coordinate as b directly instead of solving for it). Misconception: The given point's y-value is used as the y-intercept without substituting to solve for b .

8. Do the points (2, 3), (4, 7), and (6, 11) lie on one line? If yes, write the equation.

8. Yes. The slope between every pair is consistently 2. $y = 2x - 1$. Likely wrong answer: checks only one pair of points instead of both pairs. Misconception: Collinearity is judged from a single slope calculation instead of confirming it stays constant across every pair.

9. Write the equation of the line through (2, 1) and (6, 1).

9. $y = 1$ (same y-value at both points) Likely wrong answer: $x=1$ (writes a vertical line instead of a horizontal one). Misconception: Two points with the same y-value are mistaken for defining a vertical line instead of a horizontal one.

10. Write the equation of a line perpendicular to $y = 2x + 5$ that passes through (0, 4).

10. $y = -1/2x + 4$ (perpendicular slope of 2 is $-1/2$) Likely wrong answer: $y=2x+4$ (uses the same slope instead of the negative reciprocal). Misconception: The perpendicular slope condition is not applied; the original slope is reused.

11. Write the equation of a line parallel to $y = -4x + 3$ that passes through (2, -1).

11. $y = -4x + 7$ (parallel slope is -4) Likely wrong answer: $y=-4x-1$ (uses the negative reciprocal instead of the same slope). Misconception: The parallel slope condition is confused with the perpendicular one.

12. Write the equation of the line through (-2, 3) and (4, -9).

12. $y = -2x - 1$ (slope $-9-3/4-(-2)=-2$) Likely wrong answer: $y=2x-1$ (drops the negative sign when dividing two negative changes). Misconception: The signed difference between two y-values or two x-values loses its sign during subtraction.

13. Write the equation of the line through (5, 5) and (5, -2).

13. $x = 5$ (vertical line) Likely wrong answer: $y=5$ (writes a horizontal line instead of a vertical one). Misconception: Two points with the same x-value are mistaken for defining a horizontal line instead of a vertical one.

14. Write the equation of the line through (-4, -1) and (2, 5).

14. $y = x + 3$ (slope $5-(-1)/2-(-4)=1$) Likely wrong answer: $y=x-3$ (drops the negative sign when subtracting a negative coordinate). Misconception: Subtracting a negative x-coordinate is not rewritten as addition, changing the run's value.

15. Write the equation of a line with slope 0 through (6, -3).

15. $y = -3$ Likely wrong answer: $x=6$ (writes a vertical line instead of a horizontal one for slope 0). Misconception: A slope of 0 is associated with a vertical line instead of a horizontal one.

Worksheet C: Mixed Application

1. A phone plan costs \$40 per month plus \$3 per GB. Write an equation for cost C in terms of GB used, g . Find the cost for 15 GB. Then find g if the bill is \$100.

1. $C = 3g + 40$; $C = 85$ at 15 GB; $g = 20$ at \$100. Likely wrong answer: $C = 40g + 3$ (swaps the flat fee and the per-GB rate). Misconception: The flat monthly fee and the per-unit rate are assigned to the wrong roles.

2. Line A has slope 2 and y-intercept -1. Line B passes through (2, 1) and (4, -1). Write both equations.

2. Line A: $y = 2x - 1$. Line B: slope $-1 - 1/4 - 2 = -1$, so $y = -x + 3$. Likely wrong answer: Line B written as $y = x + 3$ (drops the negative sign on the slope). Misconception: A negative slope calculated correctly is written down as positive.

3. A plant is 3 cm tall and grows 2 cm per day. Write an equation for height H after d days. Find the height after 10 days.

3. $H = 2d + 3$; $H = 23$ cm after 10 days. Likely wrong answer: $H = 3d + 2$ (swaps the starting height and the daily growth rate). Misconception: The starting value and the rate of change are assigned to the wrong roles.

4. Write the equation of the line through (1, 4) and (4, 13). Does it pass through the origin? Explain.

4. $y = 3x + 1$. No, it does not pass through the origin (at $x = 0$, $y = 1$, not 0). Likely wrong answer: says yes without checking whether $x = 0$ gives $y = 0$. Misconception: A line is assumed to pass through the origin without actually testing $x = 0$.

5. Create a line parallel to $y = -3x + 2$ that passes through the y-axis at 4.

5. $y = -3x + 4$ Likely wrong answer: $y = -3x - 4$ (uses the negative of the new intercept instead of the given value). Misconception: The new y-intercept stated in the problem is replaced with an unrelated value.

6. A student writes the equation of a line with slope 6 through (4, -1) as $y - 1 = 6(x - 4)$. Explain the sign error and write the correct equation.

6. The point is (4, -1), so the correct setup is $y - (-1) = 6(x - 4)$, giving $y + 1 = 6(x - 4)$, then $y = 6x - 25$. The student wrote $y - 1$, changing the sign of the y-coordinate. Likely wrong

answer: (already given) $y-1=6(x-4)$. Misconception: The point's y-coordinate sign is dropped when substituting it into point-slope form.

7. A worker starts with \$150 saved and saves \$50 each week. Write an equation for savings S after w weeks. Find w when $S = 650$.

7. $S = 50w + 150$; $w = 10$ weeks to reach \$650. Likely wrong answer: $S=150w+50$ (swaps the starting amount and the weekly rate). Misconception: The starting value and the rate of change are assigned to the wrong roles.

8. Write the equation of a line perpendicular to $y = \frac{3}{4}x - 1$ that passes through (0, 2).

8. $y = -\frac{4}{3}x + 2$ (perpendicular slope of $\frac{3}{4}$ is $-\frac{4}{3}$) Likely wrong answer: $y=\frac{3}{4}x+2$ (uses the reciprocal without negating it). Misconception: Only the reciprocal is taken; the sign is not flipped for a perpendicular slope.

9. Are these lines parallel, perpendicular, or neither? $y = 2x + 1$ and $y = -\frac{1}{2}x + 1$. Explain.

9. Perpendicular. The slopes are 2 and $-\frac{1}{2}$, and $2 \times -\frac{1}{2} = -1$. Likely wrong answer: parallel (compares the y-intercepts instead of multiplying the slopes). Misconception: Perpendicularity is checked by comparing intercepts instead of testing whether the slopes multiply to -1.

10. A table shows: when x is 0, 2, 4, y is 8, 14, 20. Write the equation.

10. $y = 3x + 8$ (slope $\frac{14-8}{2-0}=3$, y-intercept 8) Likely wrong answer: $y=3x+14$ (uses a value from the table as the intercept instead of the value at $x=0$). Misconception: The y-intercept is read from the wrong row of the table instead of where $x=0$.

11. A delivery service charges \$12 plus \$0.75 per kilometre. Write an equation for cost C after k kilometres. Find the cost for 20 km.

11. $C = 0.75k + 12$; $C = 27$ for 20 km. Likely wrong answer: $C=12k+0.75$ (swaps the flat fee and the per-kilometre rate). Misconception: The flat starting fee and the per-unit rate are assigned to the wrong roles.

12. Write the equation of the vertical line through (-3, 4). Explain why it cannot be written as $y = mx + b$.

12. $x = -3$. It cannot be written as $y = mx + b$ because a vertical line has undefined slope. Likely wrong answer: $y = -3$ (writes a horizontal line instead of a vertical one). Misconception: Horizontal and vertical line equations are mixed up.

13. Write the equation of the line through (1, 1) and (4, 10).

13. $y = 3x - 2$ (slope $10 - 1 / 4 - 1 = 3$) Likely wrong answer: $y = 3x + 2$ (miscalculates b after finding the correct slope). Misconception: The slope is found correctly, but substituting a point to solve for b is skipped or done incorrectly.

14. Which line is steeper: $y = -5x + 2$ or $y = 3x - 8$? Explain.

14. $y = -5x + 2$ is steeper, since $|-5| > |3|$. Likely wrong answer: $y = 3x - 8$ is steeper (compares the constant term instead of the slope's size). Misconception: Steepness is judged by the y -intercept instead of the absolute value of the slope.

15. Create a real-world situation that could be represented by $y = 4x + 7$. Explain what the 4 and the 7 mean.

15. Answers vary. Example: a taxi charges \$7 to start and \$4 per kilometre, so $y = 4x + 7$. The 4 is the cost per kilometre, and the 7 is the starting fee. Likely wrong answer: describes a situation but reverses which number is the rate and which is the starting amount. Misconception: The roles of the slope (rate) and y -intercept (starting amount) are reversed in the real-world story.

Answer Key — Exit Ticket

1. $y = 5x - 11$
2. $y = -2x + 8$
3. $x = -3$

Worksheet 1: Guided Practice

1. $y = 5x - 3$
2. $y = -2x + 5$
3. $y = 3x + 2$ (from $8 = 3(2) + b$)
4. $y = 2x + 4$
5. $y = 3x - 1$ (slope $(8 - 2) / (3 - 1) = 3$)
6. Yes. Both lines have slope 2.
7. $-1/3$

8. $y = -x + 3$
9. $y = -2$
10. $x = 4$
11. $y = 2x + 5$
12. $y = \frac{1}{3}x + 2$ (from $4 = \frac{1}{3}(6) + b$)
13. $y = -4x - 1$ (from $3 = -4(-1) + b$)
14. $C = 6h + 10$
15. Yes. $2(3) + 4 = 10$.

Worksheet 2: Independent Practice

1. $y = -3x$
2. $y = x - 4$
3. $y = -x + 6$
4. $x = 7$ (vertical line)
5. $y = 2$ (horizontal line)
6. $y = 3x + 7$
7. $y = -2x + 5$
8. Yes. The slope between every pair is consistently 2. $y = 2x - 1$.
9. $y = 1$ (same y-value at both points)
10. $y = -\frac{1}{2}x + 4$ (perpendicular slope of 2 is $-\frac{1}{2}$)
11. $y = -4x + 7$ (parallel slope is -4)
12. $y = -2x - 1$ (slope $(-9-3)/(4-(-2))=-2$)
13. $x = 5$ (vertical line)
14. $y = x + 3$ (slope $(5-(-1))/(2-(-4))=1$)
15. $y = -3$

Worksheet 3: Mixed Practice & Application

1. $C = 3g + 40$; $C = 85$ at 15 GB; $g = 20$ at \$100.
2. Line A: $y = 2x - 1$. Line B: slope $(-1-1)/(4-2)=-1$, so $y = -x + 3$.
3. $H = 2d + 3$; $H = 23$ cm after 10 days.
4. $y = 3x + 1$. No, it does not pass through the origin (at $x = 0$, $y = 1$, not 0).
5. $y = -3x + 4$

6. The point is (4, -1), so the correct setup is $y - (-1) = 6(x - 4)$, giving $y + 1 = 6(x - 4)$, then $y = 6x - 25$. The student wrote $y - 1$, changing the sign of the y-coordinate.
7. $S = 50w + 150$; $w = 10$ weeks to reach \$650.
8. $y = -4/3x + 2$ (perpendicular slope of $3/4$ is $-4/3$)
9. Perpendicular. The slopes are 2 and $-1/2$, and $2 \times -1/2 = -1$.
10. $y = 3x + 8$ (slope $(14-8)/(2-0)=3$, y-intercept 8)
11. $C = 0.75k + 12$; $C = 27$ for 20 km.
12. $x = -3$. It cannot be written as $y = mx + b$ because a vertical line has undefined slope.
13. $y = 3x - 2$ (slope $(10-1)/(4-1)=3$)
14. $y = -5x + 2$ is steeper, since $|-5| > |3|$.
15. Answers vary. Example: a taxi charges \$7 to start and \$4 per kilometre, so $y = 4x + 7$. The 4 is the cost per kilometre, and the 7 is the starting fee.